ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 130.] OCTOBER. [1897.

DLXXVII.—BOTANIC STATION, SIERRA LEONE.

(With Plan.)

The settlement of Sierra Leone at one time consisted only of the peninsula terminating in Cape Sierra Leone, with an area of about 300 square miles. The Colony with its protectorate now includes a large extent of country, estimated at 4,000 square miles, or a little more than one-half the size of Wales. The capital, Freetown, lying about 4 miles up the Sierra Leone river, at the foot of a chain of hills rising from 1,700 to over 3,000 ft., contains 30,000 inhabitants, and possesses the best harbour in West Africa. It is an important coaling station and a commercial entrepôt.

The scenery of Sierra Leone is said to be very similar to that of the West Indies. The soil is fertile and there is an abundance of pure fresh water. Tropical fruits grow luxuriantly. These are described in the *Kew Bulletin* for 1888 (pp. 221–223). Pine-apples especially are produced very abundantly, while bananas, plantains, avocado pears, mangoes, limes and oranges are not only consumed locally, but are also exported to the Gambia, Goree, and Senegal.

As stated in a letter addressed by Kew to the Colonial Office, September 4, 1886, "from a scientific point of view the natural botanical productions of Sierra Leone are of extraordinary interest. Early in this century a limited number of specimens found their way into European herbaria, and show that the flora is exceptionally rich."

A very interesting work in the Library at Kew is entitled "Substance of the Report delivered by the Court of Directors of the Sierra Leone Company to the General Court of Proprietors on Thursday the 27th March, 1794." To this is attached an appendix, in which "the Directors thought proper to introduce an account of the natural productions of Sierra Leone, being the substance of two Reports made to them by Mr. Afzelius, their botanist." It is evident that more than a hundred years ago a good deal was being done to establish a successful colony in this part of West Africa. Amongst the economic plants described are rice, cassava, yams, sweet potatos, ground-nuts, eddoes, oil-palm, plantains and bananas, papaw, guava, orange and lime trees,

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pumpkins, water melon, pine-apple, pigeon pea, maize, millet, cacao, cashew nuts, okras, sugar cane, butter and tallow tree, tamarind, fig-tree, hog-plum, country plum, country grapes, sorrel, "caleelos" (spinach), mammee apple, cainito, bumelia, and icaco or pigeon plum, (from the West Indies), country cherries, bread fruit, cream fruit, cola, castor oil, "cassia of the cane," indigo, cotton, silk cotton.

"Some account of the native and introduced fruits of Sierra Leone" was published by Mr. Joseph Sabine, F.R.S., from information obtained from Mr. George Don, A.L.S., in the *Transactions of the Horticultural Society* (vol. v., 1824, pp. 439–466). This gives a very interesting account of the principal plants yielding edible fruits in West Africa, with an excellent coloured plate of the Negro Peach (*Sarcocephalus esculentus*). There are also notes on the Butter and Tallow tree (*Pentadesma butyracea*) and the Kola (*Cola acuminata*). Of the common pine-apples, even in 1824, it is stated that "they are so abundant in the woods as to obstruct the passage through them in every direction; they grow vigorously and bear fruit abundantly." The other fruits already introduced and flourishing in Sierra Leone in 1824 were bananas, plantains, cocoa-nuts, papaw, oranges, lemons, limes, cashew, rose-apple, tamarind, melons, and tomatos.

A small but interesting collection of the economic plants from Sierra Leone was presented to Kew by Mr. G. H. Garrett, a travelling commissioner, in 1891. In 1892 Mr. G. F. Scott-Elliot, F.L.S., who was attached as botanist to the Delimitation Commission of the Anglo-French frontier, forwarded to Kew 500 species of dried plants in excellent condition, and also seeds of various kinds (*K. B.*, 1892, p. 72). In the following year (1893) Mr. Scott-Elliot and Miss Catharine A. Raisin prepared Reports on the Botany and Geology of Sierra Leone (*Colonial Reports*, Miscellaneous, No. 3, Sierra Leone, 1893. *See* also *K. B.*, 1893, pp. 167–169). To the former is attached a useful list and index of native names.

"The Botanical results of the Sierra Leone Boundary Commission" formed the subject of a paper contributed by Mr. Scott-Elliot to the Linnean Society (*Journ. Linn. Soc.*, xxx., pp. 64–100).

Plants supposed to belong to a species of *Coffea* raised from seeds collected by Mr. Scott-Elliot in Sierra Leone were distributed from Kew in 1893. On further examination, these plants having developed spines, which *Coffea* never has, were believed to belong either to species of *Randia* or *Canthium* (*K. B.*, 1894, p. 79).

One of the most interesting of the economic plants of Sierra Leone is the highland or native coffee (*Coffea stenophylla*) which, though discovered about a century ago by Afzelius, was not described until 1834, and was not introduced into this country until sixty years afterwards (1894). It was figured in the *Botanical Magazine* (t. 7475), and described more recently in the *Kew Bulletin* (1896, pp. 189–191). This coffee has been widely distributed from Kew. It has lately flowered in the West Indies, and is there regarded as likely to prove useful for cultivation in lowlands where the Arabian coffee will not grow.

Another promising economic plant in Sierra Leone is the native

cotton, probably *Gossypium herbaceum*, L. In order to supplement this an effort was made some years ago to introduce the cultivation of the Egyptian cotton in the colony. The following letter affords particulars on these points :—

ROYAL GARDENS, KEW, to COLONIAL OFFICE.

Royal Gardens, Kew,
21st January, 1893.

SIR,

I am desired by Mr. Thiselton-Dyer to acknowledge the receipt of your letter of the 2nd instant forwarding a copy of a despatch from the Governor of Sierra Leone regarding the experiments made in the colony to cultivate Egyptian cotton.

2. Mr. Thiselton-Dyer has noticed with regret that these experiments have not proved successful in Sierra Leone, and that the Governor does not consider that there would be any good in forwarding more seeds to the colony.

3. It will be within your recollection that in 1890, at the request of the Government of Sierra Leone, Kew undertook to obtain a commercial valuation and report on samples of native cotton collected in Mafweh on the Bum River ; and in my letter of the 9th May, 1890, a copy of a very favourable report furnished by the Manchester Chambers of Commerce was enclosed.

4. The Sierra Leone cotton was stated to be of good quality, and valued at sixpence per pound in Liverpool. There was said to be a good demand for it, and Lancashire buyers "would gladly welcome a very much larger supply than is now available." A copy of the correspondence was afterwards published as a Government notice (No. 56, dated the 26th May, 1890) in the local gazette, and the Governor, Sir James Hay, K.C.M.G., invited "the special attention of the public to the importance of the subject."

5. It was evident that a very favourable opening existed in the Colony of Sierra Leone for extending a valuable industry. There are few West African products in the present day that offer a remunerative market. Hence this subject of cotton-growing was of peculiar importance.

6. It was thought desirable not only to encourage and extend the cultivation of the cotton already in the hands of the natives, but to introduce the more valuable Egyptian cotton, which is in great demand "for the length, firmness, and strength of the staple."

7. If owing to local circumstances the cultivation of Egyptian cotton is not practicable in Sierra Leone, it may at least be possible to extend the growth and export of the ordinary cotton. If the colony could afford to support a small botanical station in the neighbourhood of Freetown, there is little doubt that many new industries could be started that are now believed impossible. The success attained at the two stations already established in West Africa at Lagos and Aburi show that they fulfil a most useful mission in regard to developing local industries.

I am, etc.,

(Signed) D. MORRIS.

The Hon. R. H. Meade, C.B.
Colonial Office.

As the result of the conference held at the Colonial Office with the four West African Governors on the 12th September, 1893 (*Kew Bulletin*, 1893, pp. 363—365), a successful effort to start a Botanic Station in Sierra Leone was made by Colonel Cardew, C.M.G., in the following year. The subjoined correspondence indicates the steps taken to attain that object.

COLONIAL OFFICE TO ROYAL GARDENS, KEW.

Downing Street,
10th September, 1894.

SIR,

I AM directed by the Marquess of Ripon to transmit to you a copy of a despatch from the officer administering the government of Sierra Leone submitting a scheme for promoting agricultural industry in that colony, and I am to say that his lordship would be much obliged if you would favour him with your observations and opinion with regard to Colonel Cardew's proposals.

I am, &c.,
(Signed) JOHN BRAMSTON.

The Director,
Royal Gardens, Kew.

Government House,
Freetown, Sierra Leone,
9th August, 1894.

MY LORD MARQUESS,

I HAVE the honour to submit for your lordship's approval, and strongly recommend for adoption as soon as feasible, a scheme for promoting agricultural industry in this colony which the Hon. Samuel Lewis, C.M.G., has been good enough to draw up at my instance.

2. I attach a copy of the scheme. It would embrace the establishment of a botanic garden, machinery for the proper preparation of coffee and cocoa for the market, a coffee plantation, industrial farming and annual agricultural shows.

3. In view of the fact that there is now no longer any possibility of extending our protectorate, as it is hemmed in by French territory on the one side and Liberia on the other, and that therefore there is a limit to the area from which produce can be obtained, especially since the restrictions that have been imposed by the French on produce coming from the far interior, that is, from beyond the limits of our protectorate, crossing our frontier, I think it is obvious that it behoves this government to use every effort to promote agricultural industry so that the products of the land, to which alone it is reduced for its source of revenue, may be increased to their utmost capacity, not only in the colony itself, but also in the protectorate. I therefore laid Mr. Lewis' scheme before the Executive Council, at a meeting held yesterday, when the general lines of it were unanimously adopted.

4. The Council did not discuss the details of the whole scheme, as they thought that might be done better by a committee, but with a view of arriving at an estimate of the expense that would be involved by its adoption they confined themselves to the consideration of the details necessary for its initiation and

working, and with their concurrence I beg to request that your lordship may be pleased to sanction a vote on the Supplementary Estimate for £950, which would represent the initial expense of the adoption of the scheme, including the purchase of land, plant, &c., and another for £220, which would be about the proportionate annual expense for the three concluding months of this year, about the commencement of which period I hope the scheme may be introduced.

6. Turning to the consideration of the different items.

Initial Expenses.—A very suitable piece of land on the Pademba road, known as the French Company's farm, is for sale; I have visited it with Mr. Lewis; it seems well adapted for our purpose in every way. It has a picturesque site, a fine stream running through it, a good sized house on it which would do as quarters for the curator and the overseer, and some other buildings for the labourers if necessary, and a plantation, in which I am informed there is about 7,000 coffee trees, and adjoining it there is land which could be acquired if necessary at easy rates.

I have not been able to obtain as yet the exact acreage of the property, but it is, I believe, about 50, and therefore quite sufficient for present purposes. I have requested the French Company to give this government the refusal of the property, pending reference to your lordship, and this they have consented to do; in the meantime, the Acting Queen's Advocate and the officer in charge of the Survey Department, will obtain all the necessary information regarding title deeds, plans &c. I may mention that it is considered that this property is being offered on very cheap terms, and I may add that Mr. Crowther, who is the Curator of the Botanic Garden at Accra, when he visited this colony in March last, in compliance with your lordship's instructions, inspected it and reported favourably on it for a botanic garden and industrial farm.

Having in view our object, viz., the promotion of agricultural industry, the establishment of machinery for preparing the coffee berry for the market is one of the most promising proposals in the scheme. At present the berry is so bruised and broken by the crude methods employed by the native cultivators that it does not command the best prices; it is hoped that when the cultivators find they can get their coffee prepared at a cheap rate, and by doing so obtain a higher market price than by their own methods of cleaning, that they will be induced to plant more trees and that others will commence the industry.

8. I trust that I have sufficiently demonstrated to your lordship that there are good reasons for the adoption of a scheme on lines similar to that proposed by Mr. Lewis, and I may add that with a view of obtaining public opinion as to its details I have given instructions for it to be published in the *Royal Gazette*.

I have, &c.,

(Signed) F. CARDEW,

Administrator.

The Right Honourable
The Marquess of Ripon, K.G., &c., &c., &c.

[Enclosure.]

Oxford Street, Freetown,
31st July, 1894.

SIR,

WITH reference to the question which your Excellency proposed for my consideration as to the best measures to adopt for promoting agricultural industry in this colony, I have the honour to submit the following statement of my views.

2. During the last few years, owing no doubt to keener competition in trade and the diminution of profits, public attention has been much directed to the subject of agriculture, and a few efforts, more or less extensive, have been made to give practical effect to the new-born idea. Judging from attempts that I have myself made in the same direction, I have good ground for saying that there exists in the colony great ignorance of the conditions for a successful and profitable prosecution of agricultural enterprise, especially in the presence of intelligent competition abroad.

3. It is a matter of vital importance to the prosperity of the colony that steps should be taken, even at some cost, to give a right direction to the awakened impulse in favour of agriculture, and to prevent it from being succeeded by disappointment and reaction.

4. One of the points in which it is felt such direction may be advantageously given relates to the mode of preparation for market of produce, especially those exported to European and American markets. It was suggested whether in respect, at least, of the small growers, their produce might not be bought, prepared and dealt with by the government. This suggestion involves a trading by the government under circumstances in which it will come in competition with private enterprise. I think if the government should seek to carry out this suggestion, it will hinder rather than encourage the very enterprise which it is its special object to promote.

5. The Board of Education has passed a resolution not long ago, agreeing with the view, that the establishment of a botanical station in this colony should be utilized for giving and extending practical knowledge in the art of agriculture. The nature of the knowledge generally lacking is twofold, viz. :—how to cultivate the produce, and how to prepare it properly for market. The botanic station, if established, can be so arranged that, within a moderate area, it might annex to itself the work of a farm for the cultivation of a few of the main products, such as coffee and cacao, to which attention is being directed by the people here. A correct principle practised in the cultivation of one or two plants can in course of time be easily adapted by the planters themselves to others ; so that it will, according to my view, not be necessary to make at the botanic station a farm for every one of the commercial products to be grown in the colony.

6. For sometime to come coffee in particular, and cacao and cola in a less degree, will be the chief articles cultivated in the colony ; and there is already evidence of some activity in coffee growing. At the same time, there are evident to those who have any practical knowledge of the proper cultivation of fruit trees, such as the coffee, grave errors in the method adopted in the cultivation here.

7. What is in the first place required is, that the intending or actual farmer shall have some object lesson for guiding his own operation, and the opportunity of knowing the reason for adopting any specific method in farming. A few minutes of practical directions from Mr. W. Crowther, the Curator of the Government Botanical Station at the Gold Coast Colony, on his recent visit to Sierra Leone, enabled me better than months of previous reading to understand and apply the principles of pruning the coffee tree.

8. Public notice given of the time for performing certain agricultural operations at the botanical station will secure the attendance of those who desire to profit by the knowledge of these operations. It should be a part of the duty of the curator to give such notice, and to invite inspection. Thus the preparation of the ground for, and the laying of nurseries, the transplanting, pruning, mulching and shading of trees, the harvesting and curing of produce, and even the rotation of crops, may, to a great extent, be learnt by observation. At present, very few of our so-called farmers have any intelligent idea of processes so essential to the cultivation of their produce. Hence, independently of the preparation of crops for market, our colonial products are generally inferior in quality to those of foreign growth.

9. The use of implements other than the short-handled hoe and the cutlass, which constitute the whole of the farmer's tools in Sierra Leone, may be encouraged and taught by proper practice at the botanical station.

10. The next defect in our agricultural system is the generally bad or indifferent preparation of produce for the market. In cases even as in that of ginger, wherein nature seems to favour us with a good article, the preparation largely discounts the value in foreign markets.

11. The fear is naturally to be entertained that, with the extended cultivation which is going on in the colony of coffee leading to a large export, defective preparation will soon fix in foreign markets a low standard for Sierra Leone coffee.

12. The process in use for cleaning coffee in the colony is the crude one of drying the berry and afterwards pounding it in a mortar and winnowing by hand with a fan. Besides the deterioration of the quality of the bean caused by drying the berry, the pounding breaks the bean and rarely secures that evenness in the colour which complete removal of the silver skin will effect. Hence a sample of perfectly good coffee of the same natural quality and colour will have a motley appearance, in consequence of much of the silver skin remaining on the bean.

13. Then the value of the sample also depends on the uniformity in the size of the beans. The Liberian coffee, which is the quality now being largely grown in Sierra Leone, varies very much in size. Our farmers do not, as a rule, know that it will be an advantage to them to secure the uniformity I refer to. Even if they do, they will require some other process than hand-picking to secure it, otherwise the labour will be too great and prove unremunerative.

14. In two ways assistance of great value may be given by the government. For many years to come coffee, as I have already observed, will be the product that will command serious attention

in the colony. I would, therefore, recommend that the government have in connection with the botanical station a few acres under coffee cultivation. If it should be decided to purchase the French Company's coffee farm at Pademba Road, my proposal could be more readily carried out. In such a coffee farm the proper machinery, sufficient for a small farm of fifty acres, should be established for working the coffee on the station. Opportunity should be given to farmers and others who are desirous of availing themselves of it, to inspect the machinery and see how it works. Some hand machines also should be used even if it were decided to work some by power.

15. There is no machinery now imported into the colony ; and though some growers may be able and willing to procure it after seeing and understanding its use, they will act unwisely to get now what may prove to be mere white elephants in their hands.

16. The machinery required for coffee consists of pulper, peeler and sizer. Their prices vary. I have an estimate, recently submitted to me, showing that for a farm of 600 acres, the cost would be about £460, in addition to that of the motive power, water, or steam. Single pulpers are quoted as low as £20 deliverable in London. This estimate is from a Ceylon firm (Messrs. Walker, Sons & Co., Limited), who profess to have invented the best pulper for Liberian coffee. A London firm of John Gordon supplies machinery, but I do not know if their pulper is specially adapted to the Liberian coffee. American machines appear to be cheaper.

17. As some or all of the machinery above-mentioned may not be within the means of small growers, it will be an advantage to them and encourage larger cultivation among this class, if the botanical station undertake at a reasonable cost the work of cleaning the produce which may be taken to the station for that purpose. This arrangement, it is hoped, will find for the machinery and the men employed in working it, the full employment which the limited production of the station may not give, and it will help to repay the cost of its purchase and maintenance.

18. Cacao grown even in fairly large quantities does not entail much cost in preparation, for which no machinery is required. A curing establishment is all that is necessary. Mr. Crowther, in his report on his recent visit to the West Indies, says (in page 19) that the cost of the buildings needed for this purpose for a farm of 300 acres need not exceed £160. If eventually the suggestion with respect to providing the means for instructing the public as to the best mode of preparing coffee be extended to cacao, the additional cost will be comparatively small.

19. A third plan that I would suggest for encouraging agriculture is the establishment of annual shows, in which prizes are to be awarded for competition in different departments of agricultural labour, for articles and objects produced or maintained in the colony.

20. Before stating the plan in detail, I may mention that one of its objects is to direct enterprise to other channels than coffee and cacao, in order to avoid the danger of throwing all the economic egg of the colony in one basket.

21. My proposal is that the shows shall be under the patronage of the government, but directed by a committee of which the

Curator of the Government Botanical Station shall be a member; and that sub-committees in different parts of the colony, of which the District Commissioners are to be members, be formed for aiding the committee.

22. The shows are to be held in Freetown in December or January, this season being about crop time for most of our produce.

23. The articles exhibited are to include representations of all kinds of agricultural produce, in the natural as well as manufactured state, botanical specimens, and live stock. It is suggested that exhibitors of farm produce shall be the producers or their agents, and not mere collectors.

24. Between the months of July and October next before the show, every intending exhibitor of farm produce should send in to the committee a notice of his intention to exhibit, and give reasonable satisfaction that produce at the show comes from his farm. Provision should be made for the inspection in November of every farm which or the produce from which it is intended shall compete.

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32. Though the shows may be open for all kinds of produce, whether coming from owners beyond the colony, I would suggest that only farmers and inhabitants within the colony should be entitled to compete for prizes.

I have, &c,
(Signed) SAML. LEWIS.

His Excellency Colonel F. Cardew, C.M.G.,
Administrator of the Government
of the Colony of Sierra Leone.

THE ADMINISTRATOR OF SIERRA LEONE TO THE COLONIAL OFFICE.

Sierra Leone,
21st November, 1894.

MY LORD MARQUESS,

I HAVE the honour to acknowledge the receipt of your lordship's despatch, No. 201 of the 18th of September last, on the subject of a scheme for the promotion of agricultural industry in this colony and to inform your lordship that the French Company's farm fulfils the requirements specified in the letter from Kew, that it was favourably reported on by Mr. Crowther, the Curator of the Gold Coast Colony, on the occasion of his visit to this colony in April last, and that I am now concluding the purchase of the property.

2. With respect to a curator and overseer, provision has been made in the estimates for 1895 which have been passed for salaries from £200 and £80 respectively for these officials, but I gather from the letter from Kew, that the latter, if a black man from the West Indies, would require about £150 to £180 a year, and if so a curator should in due proportion be paid a salary at least from about £200 to £250, rising by annual increment of £10.

3. In view of the recommendation in paragraph 3 of the letter from Kew and the suggestion of your lordship that I should apply to Jamaica for an overseer, I propose doing so by the next

opportunity and offering a salary of £150, and with reference to the engagement of a curator, I beg to request that your lordship may be pleased to direct that a man be selected from Kew for the office and ordered to proceed here as soon as convenient on the usual conditions. His salary to be from £200 to £250 by £10 yearly, with quarters and hammock allowance at 2*s.* 6*d.* per diem.

4. As machinery for the purpose of preparing the coffee berry for the market will be required as soon as the Botanic station is established, it is very desirable that the man to be selected should obtain all the necessary information regarding it, from what firms it can best be procured and the kind best adapted for this colony.

5. Your lordship will observe that the estimates for 1895, which I propose to forward for your approval shortly, do not sufficiently provide for the salaries of curator and overseer at the increased rate which I now suggest, but as the excess of estimated revenue over expenditure amounts to £1,101 there is ample margin for the small additional sum required to meet the increased salaries.

I have, &c.,
(Signed) F. CARDEW,
Administrator.

The Most Honourable,
The Marquess of Ripon, K.G., &c.

Mr. F. E. Willey, a member of the staff of the Royal Gardens, who had previously acted temporarily as curator of the Botanic Station at the Gold Coast, was appointed curator of the new station. He embarked for Sierra Leone in November, 1895.

The following letter gives an interesting account of his first impressions of botanical work in the colony.

CURATOR, BOTANIC STATION, SIERRA LEONE, TO ROYAL GARDENS, KEW.

Botanical Station, Freetown,
4th April, 1896.

SIR,

I HAVE the honour to forward by this mail steamer, a box containing seeds of *Pentadesma butyracea*, the butter and tallow tree of Sierra Leone,* tubers of *Amorphophallus leonensis*, bulbs of two species of *Crinum* (one *C. yuccæflorum*) and one *Hymenocallis;* also two samples of coffee in parchment, viz., *Coffea liberica*, and *C. stenophylla*, and two fibres which I extracted, one from *Sansevieria guineensis*, and the other from *Hibiscus* sp.; all of which I hope will arrive in good condition.

I am going to procure a quantity of seeds of the "butter tree," for an experiment as to their oil value, as suggested in your letter of January 13th last, to the Colonial Office.

The samples of coffee, and fibre which I have forwarded, I

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* An account of this interesting tree and its produce will be found on pp. 320–325.

prepared last January for the Agricultural Exhibition. I should be pleased to hear your opinion on them, and any suggestions you might be able to add for my guidance.

I arrived here on December 2nd last, and have ever since been very busy, first with clearing the land which was in a most dreadfully tangled state, in fact the coffee trees were completely hidden by weeds; and latterly I have been laying the place out.

I have about 35 or 36 acres of land altogether, in two pieces, each about 18 acres in extent; the lower piece on which is my house, is close to Freetown, about 250 feet above sea level; splendidly situated, and well watered; a stream running through the garden.

This piece I am laying out with a view to its being an ornamental, or pleasure garden to attract visitors, being so close to the town. The great drawback is the poorness, and shallowness of the soil, in fact from 3 to 4 acres of this lower piece are bare rock (laterite). I should like to get a foot or eighteen inches of good soil put on the top, but labour is scarce. I have only 14 men to work 35 acres, and carry out alterations. And again, the men are watering for four hours each day, it is so very dry, not a drop of rain from the time I arrived until last week, when we had about ½ inch.

I have started a fair sized nursery, and built a large plant house; also cleared several large pieces of land to plant when the rains come on. I have reconstructed, and made several roads, one of which is 700 feet long and 12 feet wide with an open drain on one side, and have just completed the main road which winds around from the entrance to the curator's house. This is 850 feet long and 20 feet wide. Now, I am very busy picking Liberian coffee, and pulping it, &c.

I shall be very glad when an overseer is appointed, so as to be relieved of some of the work, I cannot now give necessary attention to many things.

The Agricultural Exhibition which was held on January 23rd and 24th, was a great success for a first attempt. It will now be held annually. I exhibited samples of coffee, cacao, cotton, fibre, gums, &c., also the coffee machines which arrived a few days before and were erected in the hall; the two small ones (one for cleaning coffee in parchment and the dry cherry huller) were worked. I also prepared articles on the preparation of coffee and cacao, which were printed in leaflet form, and distributed.

Last month I had a few days' leave, and went to a large town called Port Loko, which is about 60 miles from Freetown on a tributary of the Roquelle River. The first part of the journey up the Roquelle was unattractive, owing to the great width of the river; however, after some 10 to 15 miles it could be seen that the banks were covered with mangrove trees, and over these the tallest of the inner vegetation could be seen, of which cocoa-nuts and the silk-cotton tree formed the principal features. About 20 miles up the Roquelle we branched off into the Port Loko River. The Roquelle from this point is called the Magbeli River, from the principal town on it, Magbeli, about 70 miles from Freetown. As we could only proceed with the tide, owing to its strong flow soon after entering the Port Loko River, we stopped at an island in the middle of the river called Kasanko. Here we

stayed the night at an European factory, where they buy the produce as it is brought down by the natives in their large canoes, this is principally palm-oil, palm-kernels, and rubber; also a little camwood, gum, ivory, gold, benniseed, and kola.

The next morning, as soon as the tide was favourable, we continued our journey, the river now narrowed in considerably, and a clear view could be obtained of both banks, which were fringed with the mangrove, broken here and there by little creeks, many only a few yards wide, at the end of which a glimpse could be obtained of a native village. Wherever a large break occurred, there was situated a small town, and it was at these places that the vegetation became interesting; *Elæis*, *Raphia*, *Phœnix*, and *Cocos* represented Palmæ; also conspicuous were Adansonias, *Cola*, mango, *Eriodendron*, *Acacia*, *Dialium*, *Pentadesma*, *Hibiscus*, cotton, *Mimosa*, *Tradescantia*, *Selaginella*, several ferns including some magnificent pieces of *Platycerium* (*æthiopicum*, I suppose), and a few orchids. Owing to its being towards the end of the dry season everything was nearly withered up, and hardly a plant was in flower.

During the second day's journey, we passed some very large alligators which were sleeping on the mud banks of the river. There were also some very fine birds, pelicans, cranes, herons, curlews, &c., and many small birds with very attractive plumage. We passed several troops of chattering monkeys, whose curiosity was instantly aroused on sighting us.

I was disappointed in the general appearance of Port Loko, and neighbourhood. The town is very large, but the land was not of such a fertile character as I expected; the bush was very scrubby. A little rice, and cassava, were cultivated in some places, but no other economic products were grown except by the missionary who had a few hundred coffee trees, and at one small town on the way up I noticed about 200 trees planted out, and several thousands seedlings in beds. I could not ascertain to whom they belonged.

I must tender you my best thanks for the seeds and publications which you have been so kind as to forward to me from time to time.

I hope to be able to send more things to Kew in a few months time, especially if I am fortunate enough to get a good overseer, as then I shall have time to look around, whereas, as I am situated at present, I have absolutely no time to spare.

I have, &c,
F. E. Willey,
Curator.

W. T. Thiselton-Dyer, Esq., C.M.G., C.I.E.

The samples of coffee referred to in the first paragraph of the preceding letter were submitted for valuation and report with the following result :—

Messrs. Lewis & Peat to Royal Gardens, Kew.

6, Mincing Lane, London, E.C.,
4th May, 1896.

Dear Sir,

Your favour of the 1st inst. with sample of coffee reached us this morning.

We have carefully examined same, and beg to report as follows.

The parchment is good, clean, and bright. It has been well prepared and well cured, and very hard dried.

The coffee comes out rather brownish and foxy coated, and is small in size for Liberian ; possibly the drought has affected the coffee to a great extent, as you suggest.

To day's value is about 78*s.* to 80*s.* per cwt. if husked and sized here.

We are, dear Sir,

Yours faithfully,

(Signed) LEWIS & PEAT.

It is a very fair sample on the whole.

The report on the fibres was not so satisfactory.

"*Sansevieria guineensis.*—Fibre of good length but of bad colour. A somewhat similar sample from Trinidad was valued in 1886 at £20 per ton. Present prices would probably be much lower.

"The Hibiscus fibre is not suitable for commercial use in its present form."

Mr. James E. Hartley, a foreman at the Hope Botanic Gardens, Jamaica, was appointed overseer at the Botanic Station at Sierra Leone, under Mr. Willey, in September, 1896. He spent some time at Kew on his way from Jamaica to West Africa (*Kew Bulletin*, 1896, p. 218).

The duties of the overseer are to undertake the experimental cultivation of coffee, cacao and other economic plants, and to assist in training native boys in horticultural work.

The site selected for the Botanic Station at Sierra Leone consists of two pieces of land, one of which is shown in the accompanying plan prepared by the curator. This is the lower or north garden, about a mile from the centre of Freetown, at an elevation of 250 ft. above mean sea-level, and well sheltered from the prevailing winds. There is a perennial stream flowing through the gardens, and it is intended to tap this at a higher level, and lead the water in small rivulets or in pipes all over the ground.

The land is not yet properly fenced ; it is in contemplation to erect a strong fence, with barbed wire and hard-wood or live posts, as soon as possible. A serviceable wooden gate, with stone pillars, has been placed at the entrance near the overseer's house.

The soil is not all equally good. It is described as rather poor and shallow in places, "while from 3 to 4 acres are covered with slab rock and laterite." There is, however, a sufficient area of good soil, especially along the banks of the stream, for nurseries and propagating grounds. Other parts are suitable for being laid out in lawns, and capable, by the addition of manure and soil, for growing specimen trees in specially prepared holes.

The other portion of the station is, unfortunately, not accessible from the lower garden. It is an isolated plot situated on a slope at an elevation of 600 ft. above the sea, and contains the remains

of a small coffee plantation. The trees are looked after and regularly weeded and pruned, but beyond this it is not possible to afford them further attention at present.

Further particulars are contained in the following letter received with the plan from the curator in January last :—

CURATOR, BOTANIC STATION, SIERRA LEONE, TO ROYAL GARDENS, KEW.

Botanic Station, Sierra Leone,
January 6th, 1897.

SIR,

I HAVE the honour to forward a rough plan of the lower or north portion of the station here. I trust it will give you an idea of the progress which has been made in laying out the garden during the last 12 months.

As I mentioned in my letter of some months ago, the ground is very poor and rocky and difficult to work, consequently the results are not very encouraging.

The nurseries have made fair progress. I have quantities of the Liberian and the native narrow-leaved coffee, also cacao, about 500 kola, and about 800 eucalyptus, growing well, many over two feet high, besides black pepper and many other economic and ornamental plants.

The rainfall this last year has been very heavy, nearly 200 inches. As I was not expecting such heavy rains, I was doubtful if the roads I had made would stand it, but I am glad to say they were not damaged in the least ; but the open drains at the sides were washed out to a depth of 3 to 4 feet in some places. These have now all been made up with stone, and stout stakes driven in at regular intervals to stop the rush of water, which is very great, the garden being on a slope.

I hope to have several apprentices at work here next month ; I want to see them fairly started at work before I go on leave.

I must thank you for assisting in the selection of such a capable man as Hartley as overseer. He has worked well so far and I find him a great help and very useful.

I am a member of the Agricultural Exhibition committee here, and also one of the judges in the farm and plantation competition. The inspection of the plantations and farms entered for competition will commence in a few days. It embraces the whole of the Sierra Leone peninsula and also Sherbro Island and neighbourhood. The Exhibition is on the 16th and 17th of February ; I am preparing samples of economic products for exhibition.

Messrs. Millen & Humphries were able to stop with me for several days on their way down the coast to their respective stations.

I have, &c.,
(Signed) F. E. WILLEY.

W. T. Thiselton-Dyer, Esq., C.M.G., C.I.E., F.R.S.,
Royal Gardens, Kew.

Mr. Willey has been on leave in this country during the present year, and in accordance with an arrangement made with the Colonial Office he and the Curator of the Gambia Botanic

Station have spent eight weeks at Kew in the study of African plants and products in the houses and museums connected with this establishment, and in acquiring information in the city and elsewhere respecting the commercial value and method of treatment of subjects likely to be successfully remuneratively taken up in West Africa.

DLXXVIII.—IMPROVEMENT OF THE SUGAR-BEET AND SUGAR-CANE.

It is not sufficiently recognised that the development of the vast industry which has been founded on the beet has been only possible in consequence of the progressive increase in the yield of sugar. This has been obtained by gradual and progressive selection.

In order to obtain exact information on the subject application was made to Mons. H. L. de Vilmorin, who has had a large share in bringing the sugar beet to its present condition as a commercial source of sugar. The following interesting letter was received in reply. It gives a striking picture of what can be accomplished by persistent selection.

MONS. H. L. DE VILMORIN to ROYAL GARDENS, KEW.

17, Rue de Bellechasse, Paris,
December 30th, 1896.

DEAR MR. THISELTON-DYER,

I can very easily send you the desired information, as the subject of sugar-beet is one to which my father and myself devoted much time and attention.

Both the beet-root and the leaf-beet are derived from *Beta maritima*, L., a native of the shores of the Mediterranean and of the western coasts of Europe. It was known to the ancient Greeks and Romans under both garden forms.

In the eighteenth century large varieties of the beet-root were transferred from the garden to the field, used as food for cattle, first in Germany, afterward in France and in Great Britain.

When Achard initiated the manufacture of sugar from beet-root the white field variety was judged the most suitable for sugar-making; it contained 8 to 10 per cent. of its weight in pure sugar. Selection was then brought to bear on the existing variety, and in fifty years slightly increased the percentage of sugar, raising it to 12 or 13 per cent. (of the gross weight of the root). After 1850 more accurate means of ascertaining the amount of sugar in each individual root were introduced by my father, and in a dozen years a race was established yielding 16 and even 18 per cent. of sugar. The fibrous tissues of the root which hold most sugar had been developed and the cellular tissues reduced to the utmost extent; hence the root became small, hard, dry and easily deformed. Ever since the object has been to unite a better shape with an equal amount of sugar. Beet-roots containing more than 18 per cent. sugar cease to vegetate properly and die.

I take the liberty to send a copy of a lecture delivered during the 1889 Exposition. The sugar-beet is touched on at pp. 22

et seq. You will see that it is an exaggeration to say that the quality has been enormously increased ; but it was so in a fairly large measure ; and this has raised beet-sugar making from a bad job into a prosperous industry.

I am, &c.,
(Signed) H. L. DE VILMORIN.

In this case improvement was effected by taking advantage of seminal variation. The same method might be applied to the sugar-cane now that seedlings are obtainable with tolerable facility. But progress would necessarily be made slower than in the case of the sugar-beet.

For this reason the method of chemical selection which has been practised in Louisiana seems both more practicable and more promising. It is fully described in the *Kew Bulletin* for 1894 (pp. 86–96).

The following report gives the result of a preliminary report made last year in Barbados :—

EXTRACT from letter from Mr. J. R. Bovell, Curator, Botanic Station, Dodd's Reformatory, Barbados, to the Director, Royal Gardens, Kew, dated March 30th, 1897.

"When I was at Kew in 1894 you suggested to me the desirability of trying to increase the saccharine of the sugar-cane by chemical selection. On my return to Barbados at the end of 1894 it was rather late to start the experiment, but in December, 1895 a plot was planted with cuttings of the upper halves of canes that contained over the average amount of available sugar in the canes tested the first day. A second plot was planted with cuttings of the upper halves of those below the first day's average, and a third plot was at the same time planted in the usual way, *i.e.*, with cuttings taken indiscriminately from ordinarily well-grown canes. These plots were tested two weeks ago, and the results were very satisfactory. The canes grown from the cuttings taken from the richest canes gave the richest juice ; those from the canes lowest in sucrose the poorest juice, and those planted in the usual way coming about mid-way between the other two."

DLXXIX.—FOREST PRODUCTS OF SIERRA LEONE.

The following interesting account of the forest products of Sierra Leone and their possible development is taken from the *U.S. Consular Reports* for November, 1896 (pp. 442–444). It is an extract from an address made by the Governor of Sierra Leone (now Sir Frederic Cardew, K.C.M.G.) to the Legislative Council of Sierra Leone, on the 21st April, 1896.

Some portions of the forests described have been referred to in the report made by Mr. Scott-Elliot, already noticed in the *Kew Bulletin* (1893, p. 167–169) :—

There are large tracts of forests with abundance of rubber and valuable timber awaiting exportation. They have been in no

sense explored, and they only require intelligent and systematic methods for gathering the rubber to yield their wealth to the first comer who has the necessary enterprise.

For instance, the forest to which I have already referred as lying between Makali and Kruto may be roughly estimated to cover the greater portion of the district between the Seli river on the west and the Bagwe on the east, and an east and west line drawn through Kruto in the north, and a similar line drawn through Makali in the south.

This area comprises portions of the Kuniki and Koranko districts, and the extent of forest land within it may, on the most moderate calculation, be computed at about 600 square miles.

Along a great portion of the route taken by my party the forest is of some eight to ten years' growth, but in many parts of the district there is, I have no doubt, the virgin forest; but even in the forests of recent growth there is abundance of rubber, and three kinds of such plants were pointed out to me. Two were vines called, respectively, in the Timni language "lilibue" and "nofe," and the third a tree called in the same language "kewatia." The "lilibue" yields the choicest rubber in the protectorate. In gathering it, incisions are made in the bark of the vine, which is not, however, always cut down. In the case of the "nofe" vine it is invariably cut up into small pieces of about 6 inches in length, and thus completely destroyed. The "kewatia," *i.e.*, the rubber tree, appears to grow rapidly, and in eight or ten years to attain a girth of from 2 to 3 feet, but the tree, however, like the "nofe," is also destroyed in the process of gathering its rubber; it is felled, and the bark ringed at intervals of about 6 inches along the trunk. The rubber appears to be treated in a different way to that of the vines; the latter is, as you know, coagulated with lime juice, but the rubber which exudes from the rings cut in the tree is placed in hot water, on the surface of which it coagulates, and is then cut into strips, which are formed into balls for the market.

I have ventured, at the risk of being tedious, to go into detail in describing the manner in which the rubber is gathered.

I think we must all admit that the native processes are crude and wasteful in the extreme, and it is evident if more intelligent and economical methods were adopted, as I understand is the case in the Brazils and other parts of South America, there would be a far larger yield, and every probability that the West African rubber would command as high a price as South American. But if some steps are not taken to teach the natives better methods of extracting rubber than they now use, it may safely be predicted that with the increasing demand for rubber, in a few years the plant will become extinct, and an industry which should be one of the most thriving in the colony will be ruined.

In the forests I am speaking of the rubber is gathered by Susu traders in the crude and wasteful manner I have described. The natives in the Koranko and Kuniki districts, especially in the former, appear to be very ignorant of its value and the methods of gathering it. I feel quite convinced that if traders were to either go themselves or send as agents into these parts men well experienced in the industry, they would be rewarded for their trouble and expense with rich harvests.

The methods which prevailed in South America should be studied and adopted if found practicable here. A short account of the preparation of the Para rubber, which is the premier rubber of the world and is obtained from a large tree which forms extensive forests in the lowlands of the Amazon, was published at the recent Agricultural Exhibition, and the curator is now drawing up an account of other processes which may be suitable to the rubber industry of this colony.

The natives of the interior require to be trained in an intelligent way of working, not only in the preparation of rubber, but also in that of palm-oil. It is absurd to think that for the purpose of extracting a few ounces, or say, even pounds, of rubber, large trees should be felled, as is the case now, not to mention vines, and so completely destroyed. In the territory of the Amazon, each rubber tree is made to yield an annual crop, and the bark, instead of being ringed, has a number of incisions made in it as far up the trunk as the hand can reach, and the milk is caught in little hollowed-out lumps of clay which are placed below each incision. This work is done by the Indians, and there is no reason why the aborigines of the interior should not be taught to adopt similar methods. If the traders who purchase the rubber and other indigenous products would inform the Government in what direction they consider reforms should be introduced in the prevailing systems of gathering such produce, the Government would, I feel sure, lend an attentive ear to their suggestions.

The forests in the Kuniki and Koranko districts are, relatively speaking, very accessible from here ; Magbeli, from which place they can be entered, being distant about seven days' easy marching, and there is water carriage for light canoes from Benkia, two marches from Magbeli, down the Roquelle river.

But these forests are small compared to those on the Anglo-Liberian frontier, along the Morro and Mano rivers, which extend for 800 or 1,000 miles. Had it not been for the border raids which have been carried on for the last eighteen to twenty years, I have no doubt they would have been exploited long ago ; but there is an opportunity, now that the raiding has altogether ceased, for opening up these forests, which abound in rubber and elephants, and the southern portions of which are within two days' journey of Sulima.

DLXXX.—BUTTER AND TALLOW TREE OF SIERRA LEONE.

(*Pentadesma butyracea*, Don.)

This noble tree of West Africa is a member of the Gamboge order (*Guttiferæ*). It extends from Sierra Leone southward to the mouths of the Niger, and beyond to the equator. It sometimes attains a height of 70 ft. ; the large glossy leaves are from 5 to 10 in. long, the flowers are abundant, very handsome, and succeeded by a large, lemon-shaped brown berry, 6 in. long and 4 to 5 in. diameter, with one or two, or sometimes numerous, seeds. The plant was described by Sabine in the *Transactions of the Horticultural Society* (vol. v., 1824, p. 457) as the "Butter and Tallow tree." It has recently been figured in *Hooker's*

Icones Plantarum, pl. 2465 (1896), with a description by Professor Oliver. It is known in Sierra Leone as the "Kamoot" tree. Professor E. Heckel, in his monograph *Les Kolas Africains*, refers to it as the "Kanya" tree; and the oil or butter yielded by the seeds as *beurre de Kanya*.

The following correspondence relates to an investigation that has been carried on in this country at the request of the Government of Sierra Leone into the probable value of the seeds of this tree as a source of oil. The result, owing to the exceptionally depressed condition of the market for oil-seeds, is not very promising. It is possible, however, that the information now published may prove of service to those interested in West African products, and suggest means whereby the seeds may eventually become of commercial importance :—

THE COLONIAL SECRETARY, SIERRA LEONE, TO ROYAL GARDENS, KEW.

Colonial Secretariat, Sierra Leone,
SIR, 18th December, 1895.

I have the honour, by direction of His Excellency the Governor, to forward to you, through the Crown Agents for the Colonies, a case containing seed, flower and leaves of the "Kamoot" tree, and to request that you will be so kind as to report upon it as a plant worthy of cultivation from an economic point of view.

2. A copy of the letter of Rev. J. A. Cole, who furnished the specimens, is herewith enclosed for your information.

I have, &c.,
(Signed) J. C. GORE,
Colonial Secretary.

The Director,
Royal Gardens, Kew.

[Enclosure.]

Freetown, Sierra Leone,
DEAR SIR, November 25th, 1895.

ACCORDING to arrangement made with His Excellency Governor Cardew, I beg to forward you a package containing the seed, flower and leaves of the Kamoot tree.

It is an economic plant that may be introduced into the commerce of Western Africa. It grows extensively all along the banks of our rivers, and on the mountains. The seed yields an edible oil, highly esteemed by the interior natives.

His Excellency Governor Cardew desires it to be examined by Kew, and I arranged with him that it be forwarded through the Government.

The seed now forwarded is not fresh, and the proportion of oil may not be estimated fairly from it, but it may be possible to arrive at something more definite when fresh seeds are obtained. At present it is the flowering season, and the sample of seed is fully a year old.

I remain, &c.,
(Signed) J. AUGUSTUS COLE,

The Honourable
The Colonial Secretary,
Freetown, Sierra Leone.

THE ROYAL GARDENS, KEW, TO COLONIAL OFFICE.

Royal Gardens, Kew,
January 13th, 1896.

SIR,

I HAVE the honour to inform you of the receipt of a letter from the Sierra Leone Government of December 18th, advising the despatch of a case containing dried specimens and seeds of the Kamoot tree.

2. By means of the former we were at once able to identify it as *Pentadesma butyracea*, the "Butter and Tallow tree" of Sierra Leone, which was first described in the year 1824 by Mr. Joseph Sabine in the *Transactions of the Royal Horticultural Society*. He says "the yellow greasy juice . . . is given out copiously when the fruit is cut or opened, ... it is not, however, much used by the settlers on account of a strong turpentine flavour which belongs to it; this juice is more abundant in the seeds than in any other part of the fruit."

3. As far as I know the seeds have not been introduced into commerce as a source of oil. But I can see no reason why, as the tree is abundant in the colony, they should not be utilised. For this purpose the best plan would be to induce some oil-seed crusher at Liverpool to give them an experimental trial, and to consign to him a quantity sufficient for the purpose.

4. Probably Messrs. James Samuelson & Sons, Ltd., Scottish Chambers, 48 Castle Street, Liverpool, would be willing to take the matter in hand.

I have, etc.,
(Signed) W. T. THISELTON-DYER,
Director.

The Hon. Sir Robert Meade, K.C.B.,
Colonial Office,
Downing Street, S.W.

CURATOR, BOTANIC STATION, SIERRA LEONE, TO ROYAL GARDENS, KEW.

Botanical Station, Sierra Leone,
4th April, 1896.

SIR,

I HAVE the honour to forward by this mail steamer, a box containing seeds of *Pentadesma butyracea*, the butter and tallow tree of Sierra Leone.

* * * * *

I am going to procure a further quantity of seeds of the "butter tree," for the experiment as to their oil value which you suggested in your letter of January 13th last, to the Colonial Office.

The native tribes around here all extract an oil from the seeds and use it for cooking in the same way as they do palm-oil. I have been informed by some natives that they prefer it to palm-oil on account of its better flavour. The season for the seeds is March and April. Then the natives prepare and store a sufficient quantity of the oil to last until the next season. The oil is

extracted by drying the seeds and parching them over a fire. They are then pounded in a mortar; water is added and the whole boiled over a fire, and the fat or oil is skimmed off as it rises.

* * * * *

I have, &c.,
(Signed) F. E. WILLEY,
Curator.

W. T. Thiselton-Dyer, Esq., C.M.G., &c.,
Director, Royal Gardens, Kew.

CURATOR, BOTANIC STATION, SIERRA LEONE, TO ROYAL GARDENS, KEW.

Botanic Station, Sierra Leone,
May 19th, 1896.

SIR,

I HAVE the honour to forward by the s.s. "Ilaro," two bags containing seeds of *Pentadesma butyracea*, the butter or tallow tree of Sierra Leone.

One bag contains 57 lbs. of dried seed, and the other 115 lbs. of fresh seed. Would you kindly have them experimented upon, to ascertain their value as a source of oil, as suggested in your letter to the Colonial Office, dated January 13th, 1896?

I don't think it is necessary for me to add more, as I explained about the tree and how the natives use it, &c., in my letter to Kew last month.

The seeds are sent to Kew because it is thought that they would receive more attention from the firm in Liverpool, than if the seed was sent direct from here.

I have, &c.,
F. E. WILLEY,
Curator.

W. T. Thiselton-Dyer, Esq., C.M.G., &c.,
Director, Royal Gardens, Kew.

ROYAL GARDENS, KEW, TO COLONIAL OFFICE.

Royal Gardens, Kew,
10th December, 1896.

SIR,

WITH reference to my letter of the 13th January last, I have the honour to inform you that a consignment of the seed of *Pentadesma butyracea*, the butter and tallow tree of Sierra Leone, was received from the Government of that colony in June last.

2. This seed was at once forwarded for investigation to Messrs. Samuelson & Sons, Ltd., of Liverpool, and the result is contained in the enclosures herewith.

3. The price of seed oils in this country at the present time is rather low and hence the estimated value of the tallow seeds stated by Messrs. Samuelson & Sons (to use their own words) "is hardly a fair one upon which to base calculations as to the real commercial value of the seeds."

4. Nevertheless the investigation has been a useful one and the thanks of the Government are due to Messrs. Samuelson & Sons for the trouble they have taken in the matter. We now know for the first time the percentage of oil in these seeds and the probable uses to which it can be applied.

I have, &c.,
(Signed) W. T. THISELTON-DYER,
Director.

The Hon. Sir Robert Meade, K.C.B.,
Colonial Office,
Downing Street, S.W.

[Enclosure 1.]

Messrs. SAMUELSON & SONS TO ROYAL GARDENS, KEW.

Scottish Chambers,
48, Castle Street, Liverpool,
23rd October, 1896.

DEAR SIR,

WITH reference to the investigation with the "butter and tallow" seeds received, we find they contain 41 per cent. of oil, of which we send you a small sample. Our investigations have hitherto only been in the laboratory, and the quantity supplied is not large enough for a practical test.

The oil, we think, would be suitable for soap-making; this we shall be able to ascertain in the course of a week or two, as we are getting one of our soap-making friends to try it. If it should be suitable for soap-making, and the refuse suitable for cattle foods, we think the price of the seeds ought to range from £8 to £10 per ton, delivered in England, according to the state of the market.

Yours truly,
(Signed) EDW. SAMUELSON.

The Director,
Royal Gardens, Kew.

[ENCLOSURE 2.]

Messrs. SAMUELSON & SONS TO ROYAL GARDENS, KEW.

Scottish Chambers,
48, Castle Street, Liverpool,
8th December, 1896.

DEAR SIR,

THE writer saw Mr. H. S. Timmis, of Messrs. Gossage & Sons, yesterday, and he reports that the oil made from the nuts of which you sent us two sacks, is (though not an oil of high quality) undoubtedly suitable for soap-making, and, so far as we can tell you, would probably fetch about £2 per ton less than palm-kernel or cocoa-nut oil. Both these oils are very low at present (very little over £20 per ton), and perhaps to-day's price is hardly a fair one to base any calculations on as to the commercial value of the nuts.

The cake we have not yet had a report upon; but as soon as we have, we will send it on to you. We do not think it can by any possibility be worth more than £3 per ton, which would to-day give the selling value of the nuts at a maximum of £6 per ton, delivered in Liverpool. Whether it would pay to import at this price we very much doubt, and from what we can see of the oil we think it would not be suitable for any other purpose than soap-making. It is not good enough for candle-making, and it is too dear for mixing with mineral oil to make a solid lubricant.

Any further information we get on the subject we shall at once send you.

Yours truly,
(Signed) EDW. SAMUELSON.

The Director,
Royal Gardens, Kew.

DLXXXI.—COFFEE CULTIVATION AT THE GOLD COAST.

The progress made in the cultivation of coffee at the Gold Coast has been noticed in the *Kew Bulletin* (1895, pp. 12, 21 and 165). In the *Blue Book Report* for the year 1893 (*Colonial Office Reports*, Annual Series, 1895, No. 136) the following account was given of the experiments carried on in connection with coffee and cacao at the Botanic Station at Aburi :—

"A good deal of general work has been done in the Government Botanical Station during the year and considerable attention has been paid to the plantations of coffee and cacao, in the cultivation of both of which, but more especially the former, the natives appear to have become interested. Along the road leading from the Botanical Station through the country of Akwapim to the interior are large numbers of small clearings in which coffee plants, chiefly obtained by purchase from the Botanic Station, are to be seen in a most flourishing condition. The Liberian coffee plant appears to thrive best, but there are large quantities also of the Arabian coffee plant, the berry of which, however, is small and apparently deteriorated. It will probably be necessary for the Government at no distant date, if the coffee industry is to be fostered into a trade, to instruct these native cultivators in the proper way of preparing the berry for export. At present the most primitive method is employed. The berries are scraped by hand with a round stone worked in the hollow of a larger stone, and after this process they are washed and dried in the sun. It is obvious that a large crop could not be so dealt with, and that the employment of machinery in the near future is imperative. The initiative will have to be taken by the Government, because of the general ignorance on the part of the natives of all machinery, even of the simplest character, and because no single native cultivator possesses sufficient capital, enterprise, or experience to take the matter in hand."

During the last two years the Government has introduced machinery for pulping and curing coffee, and consignments of both coffee and cacao have been forwarded through the Crown Agents for sale in the London market. This plan afforded the best means for

testing the commercial value of the produce, and it is gratifying to find that the result shows that coffee and cacao can be grown in West Africa capable of realising good prices in European markets. Much still remains to be done to induce the natives to cultivate and cure their produce in a satisfactory manner.

During the year 1896 there were shipped from the Aburi Botanic Station 30 bags of coffee and four bags of cacao. The return sales were as follows:—

CROWN AGENTS TO COLONIAL SECRETARY, GOLD COAST.

Downing Street, S.W.,
17th July, 1896.

SIR,

I HAVE the honour to inform you, with reference to your letter of the 15th April last, that we have caused the bags of coffee and cocoa sent home per s.s. "Cabenda" to be sold at the Commercial Sale Rooms, Mincing Lane, London, by a first class firm of colonial brokers, Messrs. Rucker & Bencraft, and the following has been the result:—

COFFEE.

The 26 bags marked L were examined, sorted, cleaned, husked, and then refilled into 15 bags, and were sold at the rate of 70/- per cwt.

The four bags marked A were similarly treated, refilled into two bags, and sold at the rate of 56/- per cwt.

	£	s.	d.
The net amount realised for the coffee was	55	10	0
COCOA.			
The four bags of cocoa were sold at the rate of 37/- per cwt., the net amount realised being	6	2	1
	61	12	1
The freight to Liverpool, and charges there, were	4	12	3
Net total realised ...	£56	19	10

I enclose, for the information and guidance of the Colonial Government, copies of the letters, reports and account sales which we have received from the brokers.

I have, &c.,
(Signed) E. E BLAKE.

[Enclosure.]

MESSRS. RUCKER & BENCRAFT TO CROWN AGENTS.

37, Mincing Lane, E.C.,
8th July, 1896.

GENTLEMEN,

THE four bags cocoa will be offered at public sale on Tuesday next.

Referring to the shipment of coffee and cocoa—

1st. We should recommend your friends to use stouter gunny for their bags.

2nd. To dry their Mocha seed coffee more before shipping it in husk.

3rd. To clean their Liberian coffee themselves before shipping, the husk being so heavy, and there being no colour to preserve.

Yours, &c.,

(Signed) J. A. RUCKER & BENCRAFT.

The shipments for the current year (1897) are described in the following corrrespondence :—

CURATOR, BOTANIC STATION, GOLD COAST, TO ROYAL GARDENS, KEW.

Aburi,

DEAR SIR, 13th June, 1897.

I HAVE taken the liberty of writing to inform you that the Botanic Station is now properly fenced in. It was completed on the 12th instant ; there are two gates which are locked after 5 p.m.

The shipment of coffee and cacao for 1897 from this station is as follows :—

Liberian coffee, dried in parchment	...	46 sacks.
„ „ cherry dried ...	...	8 „
Arabian „ dried in parchment	...	5 „
Cacao	...	9 „
Total	...	68

This was sent off about the end of May, and with the exception of the five sacks of Arabian was harvested and prepared by myself.

I am, &c.

(Signed) C. H. HUMPHRIES.

The Director,
Royal Gardens, Kew.

Messrs. RUCKER & BENCRAFT TO CROWN AGENTS.

37, Mincing Lane, E.C.

GENTLEMEN, 17th August, 1897.

WE have now the pleasure to enclose contract for eight bags cocoa ex "Bathurst" at 58/-.

The price is very satisfactory : there is at the moment a considerable speculation current in cocoa, and a few months ago such cocoa would only have realised about 40/- per cwt.

In a rising market common sorts always reap the greater advantage, in falling markets they suffer more than fine cocoas.

The outside appearance of this cocoa is fairly good, the break is too dark and often defective. The dark colour of the beans you may be able to remedy, they ought to be rosy in colour ; the defective can certainly be got rid of by more careful curing.

We are, &c.,

(Signed) J. A. RUCKER & BENCRAFT.

ACCOUNT SALE of 8 bags cocoa, per "Bathurst" (s.) at Accra, sold by order and for account of the Crown Agents for the Colonies.

1897.
August 17th.

		c. qrs. lbs.		£	s.	d.
8 bags	... ...	8 2 2 at 58/-	...	24	14	0
	Discount, 2½ per cent. ...		...	0	12	4
				£24	1	8
	Charges		...	1	13	4
	Net proceeds		...	£22	8	4

Messrs. RUCKER & BENCRAFT TO CROWN AGENTS.

19th August, 1897.

GENTLEMEN,

REFERRING to the sale of your coffee yesterday 23 bags ex "Bathurst" was a normal lot of African Liberian and sold at about value.

Two bags ex "Bathurst" was a retail lot and would have sold at 10/- more money if there had been 20 bags of it.

As regards three bags ex "Bathurst" this was also a retail lot, but in quantity it would not have fetched much more money. As to the preparation of this lot, we should imagine much could be done to improve quality, the coffees appear thoroughly worm eaten and the appearance is very rough.

Yours, &c.,
(Signed) J. A. RUCKER & BENCRAFT.

ACCOUNT SALE of 28 bags coffee, per "Bathurst" (s.) at Accra, sold by order and for account of the Crown Agents for the Colonies.

1897.
August 18th.

		c. qrs. lbs.		£	s.	d.
23 bags	...	28 0 21 at 39/6	...	55	13	5
2 „	...	2 2 3 „ 24/-	...	3	0	8
3 „	...	2 3 22 „ 39/6	...	5	16	5
28 bags		33 2 18		£64	10	6
	Discount, 1 per cent. ...		...	0	12	11
				£63	17	7
	Charges		...	15	6	1
	Net proceeds		...	£48	11	6

DLXXXII.—BOTANICAL ENTERPRISE IN WEST AFRICA.

The development of the system of Botanic Stations in West Africa has been recorded from time to time in the pages of the *Kew Bulletin*. The earliest station was started at Lagos by Sir Alfred Moloney, in 1888 ; the next at Aburi on the Gold Coast, in 1890, under the supervision of Sir W. Brandford Griffith. The station at the Gambia was established in 1894, and in 1895 Sir Frederic Cardew was successful in arranging for what promises to be a useful station at Freetown, Sierra Leone.

In addition to these, a station was established in 1891, under the Foreign Office, in the Niger Coast Protectorate.

The early attempts to start these stations were necessarily of a tentative character. But the measure of success which attended their efforts to develop the material progress of the West African Colonies led to a desire to place them on a more permanent footing. At a conference held at the Colonial Office, in September, 1893, at which the four West African Governors were present (*Kew Bulletin*, 1893, pp. 363–368), steps were taken to extend the Botanic Station system and to improve the position and standing of the curators.

As a result of this conference, the Botanic Stations in West Africa have been placed on a similar footing to those existing in other parts of the Empire, and their influence and usefulness are steadily increasing. The health of the curators has, on the whole, been satisfactory. The only death amongst the Curators of the existing stations occurred at Aburi in 1895, when Mr. W. Crowther, a remarkably promising man, died after nearly four years' service. There is no doubt that the special leave on full pay granted to West African officers is absolutely necessary to the preservation of health in that part of the world. In order to create an efficient body of native officers to assist in the work of the Botanic stations, and take charge during the absence of the Curators, arrangements were made to train negro boys in horticultural work, and to make a selection of the most promising for further training in the West Indies or at Kew. Two such boys from Lagos were trained by the Botanical Department in Jamaica, and afterwards received at Kew for nearly eighteen months. They returned to West Africa in May, 1894. One is now in charge of the Government House garden and grounds, while the other is Assistant Curator at the Botanic Station.

It is hoped that efforts will be made to train similar men in the other Colonies.

In the meantime it has been sought to increase the efficiency of the Curators themselves, and to afford them opportunities for becoming thoroughly acquainted with the possibilities of development of West African industries.

The official action taken in this direction is shown in the following correspondence :—

ROYAL GARDENS, KEW, TO COLONIAL OFFICE.

Royal Gardens, Kew,
March 25th, 1897.

SIR,

IN the memorandum, approved by the Secretary of State, transmitted in Mr. Bramston's letter of September 25, 1893, the conditions of employment of the Curators of the several Botanic Stations in the West African colonies are laid down.

2. Number 4 of these provides that these officers shall have the benefit of the Colonial Regulations as regards, amongst other things, leave. They are therefore entitled to six months' leave of absence on full pay after twelve months' consecutive service in the Gold Coast Colony and Lagos, and after fifteen in Sierra Leone and the Gambia.

3. While I am satisfied that this privilege is essential to the preservation of health necessary for the efficient performance of their duties, I am doubtful whether it is altogether satisfactory to treat such prolonged leave exclusively as holiday. No doubt men, animated with some zeal for their duties, will devote a portion at least of their leave in this country to work which would increase their efficiency. But they are at present under no obligation to do so. It appears to me, therefore, a matter well worth the consideration of the Secretary of State whether in this particular case some modification of the general regulation should not be made.

4. I would suggest that each Curator on his return to England should be required to report himself at Kew, and to devote two months of his leave to the study of such subjects, whether commercial or horticultural, as the Director may indicate to him, and that, further, the receipt of his pay for that period shall be contingent on a certificate from the Director that he has employed himself for the time specified in a satisfactory manner.

I am, etc.,
(Signed) W. T. THISELTON-DYER.

Edward Wingfield, Esq., C.B.,
Colonial Office,
Downing Street, S.W.

COLONIAL OFFICE TO ROYAL GARDENS, KEW.

Downing Street,
13th April, 1897.

SIR,

I AM directed by Mr. Secretary Chamberlain to inform you, in reply to your letter of the 25th of March, that he entirely agrees with you in thinking it desirable that the Curators of Botanical Stations in the West African Colonies should be required to devote a portion of their leave of absence to work which would increase their efficiency.

2. It has always been held by the Secretary of State that the leave which is granted to Europeans in the service of the West African Colonies is not to be treated as an ordinary holiday, and that those that receive it may be called upon to undertake any work, or go through any course of instruction that the Government

may think desirable. Many officers have been required to do so, and there will be no difficulty in laying down the rule which you suggest in the case of Curators.

3. A copy of your letter and of this reply will be sent to the Governors of the four West African Colonies, for their information and guidance.

4. I am to add that Mr. F. E. Willey, the Curator of the Botanical Station at Sierra Leone, has recently arrived in this country, and that he will be told to report himself to you, with a view to his devoting two months out of his time in England to the study of such subjects as you may indicate to him.

I am, &c.,
(Signed) EDWARD WINGFIELD.

The Director,
Royal Gardens, Kew.

COLONIAL OFFICE TO ROYAL GARDENS, KEW.

Downing Street, 6th July, 1897.

SIR,

I AM directed by Mr. Secretary Chamberlain to acknowledge the receipt of your letter of the 24th of June, in which you suggest that Curators of West African Botanical Stations, who are called upon to pursue a course of study at Kew during their leave of absence, should receive an allowance of £10 to cover all travelling and other expenses.

2. It has occurred to Mr. Chamberlain that hardship might be caused in individual cases by the grant of a fixed sum to cover travelling expenses, which must of course vary greatly. He would suggest, therefore, that, unless you see any objection, the allowance should be a fixed sum of £1 for every week spent at Kew, and that the travelling expenses actually incurred should be paid to men who do not live in or near London.

3. The money would only be paid on the receipt of a certificate from you that the officer had completed his studies at the Royal Gardens to your satisfaction.

4. It would be understood that the allowance of £1 a week was made to cover all expenses save those of travelling, and that the only additional payment would be for railway fare from the officer's usual place of abode to Kew, and back again, on the completion of the course.

5. It may be assumed that the total payment to be made would not as a rule amount to more than £10, and Mr. Chamberlain agrees with you in thinking that this sum need not be exceeded unless an officer is forced to pay heavy travelling expenses.

I am, &c.,
(Signed) JOHN BRAMSTON.

The Director,
Royal Gardens, Kew.

During this summer, Mr. F. E. Willey, Curator of the Botanic Station at Sierra Leone, and Mr. Walter Haydon, Curator of the Botanic Station at the Gambia, have devoted eight weeks of their leave (July 5th—August 25th) to a course of study of economic subjects at Kew. They have carefully examined the West African

products in the Museums of Economic Botany, and made notes of those not yet brought into commerce. They have paid special attention to rubbers, fibres, coffee, cacao, spices, and gums, and spent some time in consulting standard books affording the latest information on these and similar subjects. While studying the economic collections of living plants they have made out lists of those likely to be suitable for West Africa, and arrangements have been made to send out a selected number of such plants with them on their return to the Colonies. Visits were arranged for the inspection and trial of machinery for the preparation of coffee and other tropical products, and also to the principal sale rooms in Mincing Lane.

The following memorandum will show what was accomplished in one day's visit to the latter :—

"About a dozen of the principal produce brokers were visited, and large collections of products were seen and examined in the various offices.

"The samples of ginger were particularly interesting. We spent some time in comparing the samples of African ginger, from Sierra Leone, with those which had arrived from the West Indies.

"A considerable difference was noticed in the character of the produce when the two sorts were compared.

"The samples of ginger from Sierra Leone were all coated, and the rhizomes were small. The quality was poor, and the prices obtained were only about one-third of those of the best Jamaica ginger.

"A small quantity only was shown of coated ginger from the West Indies. In nearly all the samples the rhizomes were very much larger than those from Sierra Leone.

"The principal brokers visited were Messrs. Lewis & Peat. Here were seen Jamaica sarsaparilla, Rio and Carthagena ipecacuanha, Chinese star anise, Tinnevelly and Alexandrian senna, Kombe (*Strophanthus hispidus*), Pudding pipe (*Cassia fistula*), coffee, cinnamon, peppers, chillies, nutmegs, mace, and other spices.

"The other products noted during the day were gums, wax, tapioca, ginger, cloves, sugar, cascarilla bark, buchu leaves, myrrh, simarouba bark, &c.

"Fibres were not so numerous as other products, but a few were observed, including raffia, piassaba, bowstring hemp, Mauritius hemp, cocoa-nut coir, and West African piassaba. Very little of the latter was seen.

"After leaving Mincing Lane, a visit was paid to a warehouse in Crutched Friars, where the various drugs were to be seen in bulk, amongst them dragon's blood, gamboge, aloes in skins and in boxes, gum guaiacum, sarsaparilla in bales, ipecacuanha, benzoin, and various other products."

(Signed) WALTER HAYDON.

There can be little doubt that the opportunities thus afforded will be of considerable value in increasing the efficiency of the officers concerned, and in enabling them to disseminate the most recent information in regard to West African industries. It is

impossible to over-estimate the value of such training, and there can be little doubt that the result will be apparent in a much more rapid advance in the material development of these Colonies, which have hitherto been almost entirely dependent on trade in native and forest products, and have devoted little attention to the systematic cultivation of the soil.

DLXXXIII.—MISCELLANEOUS NOTES.

Mr. Louis Gentil, a member of the gardening staff of the Royal Gardens, has been appointed by the Government of the Congo Free State to the post of Agricultural Expert. He leaves for Africa in October.

Botanical Magazine for September.—Plates 7552 and 7553 are given to a new species of *Scheelea*, described as *S. kewensis*. It is a native of tropical America, and has been cultivated in the Royal Gardens for many years under the wrong name of *Maximiliana regia*. The plant is now 25 feet high, and flowered for the first and only time in 1895. Other plants drawn are *Cirrhopetalum Curtisii*, *Helianthus giganteus*, and *Veronica balfouriana*. The *Cirrhopetalum* is also a new species, having been sent to Kew by Mr. C. Curtis, F.L.S., of Penang. It is allied to *C. Roxburghii* and *C. concinnum*, both of which are figured in *Hooker's Icones Plantarum*, plates 1057A and 2060B. The *Helianthus* is a very old species, being mentioned in botanical works published at the end of the seventeenth century. The specimen figured was supplied by A. B. Freeman Mitford, Esq., C.B., from his fine garden at Batsford Park, Gloucestershire. The New Zealand *Veronica* is the third new plant published in this number of the Magazine. It approaches *V. Traversii* (plate 6390), differing somewhat in habit, and having longer racemes. The specimen figured was grown in Sir J. D. Hooker's garden at Sunningdale.

Victoria regia.—A new variety of this fine water-lily has been grown at Kew this year. It was raised from seeds received from Mr. H. A. Dreer, nurseryman, Philadelphia. It differs from all other forms in the pale green colour of its leaves, of a rich red underneath, the turned-up rim, which is from 6 to 8 ins. high, the absence of spines on the calyx lobes, and the time when the flowers expand, which is early in the afternoon instead of about six o'clock. It also grows with extraordinary vigour. and flowers more freely than the type. A second plant sent from Kew to the Royal Botanic Gardens, Glasnevin, has shown the same characteristics.

New Wing of Temperate House.—Kew is well supplied with accommodation for plants requiring the temperature of the stove and cool greenhouse, but has long wanted an "intermediate house" of larger dimensions than the Conservatory (No. IV.).

This has been supplied by the erection of the South Wing of the Temperate House. It was included in the original design by

Decimus Burton, the construction of which was commenced in 1860. The octagons were finished in 1861, and the centre block in 1862. The two wings were postponed, although the raised terrace had been prepared for them.

This important addition has been secured in great measure by the exertions of the Right Honourable Joseph Chamberlain, Secretary of State for the Colonies. It is intended to devote it mainly to large specimens of economic plants, such as the Mango, Guava, Cinchona, Sisal Hemp, &c. The construction is composite; the steel principals are supported on cast-iron columns; the sashes and frames are of wood. The internal dimensions are 112 ft. 6 ins. by 62 ft. 6 ins. The height of the centre is 38 ft; that of the side aisles 27 ft. 6 ins. The whole of the plants are grown in beds, the total area of which is 4,842 square feet. The central area is divided into four of these, each 41 ft. by 15 ft. 8 ins. Others, 7 ft. wide, run all round the sides and ends of the house. A thorough system of subsoil drainage has been provided throughout.

In the centre block Australian vegetation is predominant; the South Wing will have largely a Mexican character. At the south end this is emphasized by two pieces of rockwork which have been planted with Agaves, Opuntias, and *Cereus*. With these are associated the Old World Euphorbias and Aloes of corresponding habit. Along the centre path is an avenue of *Cocos plumosa*. Other forms which will be found are *Erythea armata*, *Howea belmoreana*, *Pseudophœnix Sargentii*, *Geonoma gracilis*, *Chamædorea elatior*, *Chrysalidocarpus lutescens*, etc. With these are intermixed a large number of interesting flowering shrubs, such as *Lagerstræmia*, *Mackaya*, *Erythrina*, *Blakea*, *Alberta*, *Luculia*, etc., for the proper cultivation of which Kew has hitherto been unable to provide the proper conditions. It is intended to proceed at once with the erection of the North Wing, for which a vote on account has already been taken. It is proposed to devote this principally to Himalayan plants.

Water Supply.—When Kew was first devoted to public purposes the area under cultural treatment was very restricted. Up till 1850 the Botanic Garden was supplied with water pumped by a horse-wheel engine (near the present Cumberland Gate) from a well. In that year Messrs. Easton and Amos were employed to erect a steam pumping-engine, with reservoir in the Campanile, for supplying water from the Thames for the Botanic Garden. In 1853 the fountain in the pond was made. About 1855 the pumping station was removed to near Kew Palace. With the growth of the establishment a more extensive supply was required, and the direct supply of Thames water proved unsatisfactory owing to its leaving a muddy deposit on the leaves of the plants. In 1864 the engine house in the pleasure grounds was built to pump the water from the lake. In 1866–8 the present water-works were constructed; the tidal water enters the lake from the river, and after settling is passed through a filter-bed, and then pumped to a reservoir in Richmond Park. The water is thence distributed at high pressure over the grounds, and is also laid on to the Museums, Herbarium, and the Crown property.

For some time this arrangement provided an adequate supply of water for the needs of the establishment. But in recent years it is notorious that the Thames has undergone a considerable change. From various causes it has acquired some of the features of a torrent. Often in flood in winter, it is frequently in the neighbourhood of Kew almost dry in summer, except when filled by the tide. The tidal wave is more rapid and often short, and it is now difficult to secure a sufficient supply to fill the lake on which the whole system of water-supply depends. The first step to remedy this state of things was to make, in 1887, a four-foot culvert calculated to admit at one tide four times the amount of water previously taken in. But the emptiness of the bed of the river during the summer months had another and unforeseen effect. The Royal Gardens are situated on a vast bed of river gravel, which is everywhere pervious to the water of the river. There can be little doubt that the average level of the ground-water has of late years considerably fallen. The effect manifests itself in many ways during dry summers. The older trees suffer severely, and many which have succumbed have had, in consequence, to be removed. The turf and shrubberies have suffered still more, and can only be kept in a tolerable condition by incessant and copious watering. A large extension of the system of water-supply had therefore become absolutely necessary if the attractions of Kew as a garden were not to be destroyed, and the unique collections of plants growing in the open air to suffer irreparable damage. The first step was to remove the vast accumulation of mud, in great part London sewage, from the lake. This was accomplished by the employment of discharged soldiers during the winters of 1891–4. The mud was spread on the stretches of turf to their great advantage. The next was to increase the pumping power, and this was accomplished by the erection, in 1895, of a triple-expansion pumping engine auxiliary to the compound steam-engine erected in 1864. It was followed by the laying down of a complete system of service pipes throughout the establishment. This has been distributed over the past three years and is now completed. At the same time all the hydrants have been fitted with a uniform screw, so that the hose and other apparatus are everywhere interchangeable. The multiplication of stand-pipes will eventually lead to considerable economy by saving the wear and tear inseparable from the use of india-rubber hose in great lengths.

The water-works in the Royal Gardens were connected with the reservoir in Richmond Park by a single seven-inch main, laid down in 1868. This had, owing to the strain of the double purpose it served, shown signs of giving way, a state of things which might have caused grave inconvenience, and, in the event of fire, serious disaster.

During the past winter a second nine-inch main, two-and-a-half miles long, has been successfully laid. As this had to be carried under the line of the London and South-Western Railway, the operation was attended with considerable difficulty. It was, however, successfully accomplished by Messrs Simpson and Co., under the superintendence of Mr. J. Allen, the Assistant Clerk of the Works. The old main is now only used for the distribution of water to the service pipes.

It is further proposed to duplicate the filter-beds. The sand in these requires to be washed periodically, and during this operation the water-supply is either curtailed or altogether in abeyance. A second set is required, a need which was pointed out as long ago as 1875 by the Surveyor of the Office of Works.

Finally, it will no doubt be necessary ultimately to enlarge the reservoir in Richmond Park so as to maintain a more copious head of water in seasons of great drought, such as have been recently experienced.

These particulars are put on record because, probably, few of the visitors to Kew realise the anxiety and expense which, in this and other matters, the maintenance of a great garden imposes on those who have the care of it.

Chinese Bandoline Wood.—The origin of this curious product, of which a specimen has long been in the Museum of the Royal Gardens, has always been a puzzle.

Shavings of the wood yield a mucilage, when soaked in water, which is used by Chinese ladies in "bandolining" their hair. Dr. E. Bretschneider (*Notes on some Botanical Questions connected with the Export Trade of China*, 1880, p. 14) mentions the shavings as being exported from Canton to Peking under the name of "meio kao pao hua" (i.e., cosmetic glue shavings), and their probable source as *Sterculia platanifolia*. In 1895, G. M. H. Playfair, Esq., H.B.M. Consul at Ningpo, sent to Kew specimens in leaf of a tree, called "tiao chang," which he had collected in the mountains near Ningpo, with the information that shavings of the wood were used for the purpose described above by the women of that part of China. These specimens were identified as *Machilus Thunbergii*, Sieb. et Zucc., and flowering specimens subsequently received from the same gentleman confirmed the identification. Mr. Playfair further adds, on the authority of Dr. A. Henry, that the Canton shavings are from the same tree.

The species is a native of Hong Kong and Chekiang westward to Szechuan, in China; also of Formosa, Japan, and the Corean Archipelago. Owing to the interest attaching to the identification, the species has been figured in *Hooker's Icones Plantarum*, (t. 2538).

The following communication from Mr. Playfair gives some further particulars:—

H.M. Consulate, Ningpo,
March 2, 1896.

My Dear Mr. Thiselton-Dyer,

Please do not retain any doubt at all about the identity of the specimen I sent you of *Machilus Thunbergii* with the Chehkiang tree, which produces bandoline shavings. I cannot, of course, vouch for the Canton shavings as being produced by the same tree, but there is no question that what I sent you does have a glutinous juice, for I tested the large branches thoroughly before sending the smaller piece. My entire specimen was about 12 feet long, and the branch measured quite $2\frac{1}{2}$ inches in diameter. When cut into chips it produced a viscid matter, when soaked in cold water. It is possible that the smaller twigs are not equally viscid. The tree grows in this neighbourhood, and the shavings

used by the Ningpo women are procured locally. It is possible that the Canton shavings may be produced by a similar tree, but I cannot vouch for it. I will procure fruiting and flowering specimens this year, if possible, but the nearest tree I know of is a long way off.

Yours sincerely,
(Signed) G. M. H. PLAYFAIR.

Stooling of gutta percha.—The question whether the tree yielding gutta percha (*Dichopsis Gutta*, Benth.,) will produce shoots from the stump after the tree has been felled is of some practical importance. It appears now to have been disposed of in the affirmative :—

EXTRACT from letter from Director, Gardens and Forest Department, Singapore, dated July 3, 1897.

Re Prof. Ramsay's letter about stooling of "Getah percha." The tree always comes up again when cut down. It can be cut to within six inches of the ground, and will then throw up shoots. Were it not for this there would hardly be a single specimen in this country. It grows slowly in this manner, but never fails to come up again.

It is a very troublesome plant to propagate by cuttings, but this can be done.

Argentine palm kernels.—The palm-kernels to which the following communication relates, were identified at Kew as those of *Acrocomia sclerocarpa*. This is known as the Gru-gru or Macaw palm. It is a native of Jamaica and other West India islands, and of South America from Brazil southwards. The nuts do not hitherto appear to have been turned to any use, though their shell, which is very hard, has been sometimes used for carving.

African Association, Limited.
35a, Castle Street, Liverpool,
May 25, 1897.

DEAR SIR,

My Board instruct me to ask the favour of some information from your department in regard to a considerable quantity of palm kernels lately arrived at this port from the Argentine Republic. They are informed that a very large tract of country produces the palm from which these kernels are gathered, and seeing the large interest of this Association in palm kernels from the Niger Coast Protectorate and other West African districts, my Board are naturally desirous to get what information they can in respect to this new competing product. Can you for their information be so kind as to say, is the palm of the Argentine region a true oil-palm, and would the fruit or kernel of this palm be likely to compare closely, or differ considerably in oily product, from that in which this Company is interested.

Yours faithfully,
(Signed) J. HAMPDEN JACKSON,
Secretary.

The Director,
Royal Gardens, Kew.

Asclepias curassavica as an insectifuge.—The use of this plant for the purposes described in the following communication appears to be unrecorded :—

Rostherne, Red Hill, Surrey,
July 21, 1897.

Miss Manning would be greatly obliged if the Director would tell her what the enclosed plant is. It grows everywhere, as a weed, about the Isthmus of Tehauntepec (Southern Mexico), and is used by the Indians there to keep away vermin, especially fleas. Miss Manning's friends in Mexico have tried it, and found it most successful. They make a rough broom of it, and sweep the floors and walls of their huts, and find that they are not troubled with fleas for a considerable time afterwards. They have tried brushing dogs with it when their coats are full of vermin, and it appears to answer the same purpose with them.

The Indian name of the plant is "Chilpati."

Osiers from Madeira.—The decay of osier cultivation in this country has been discussed in the *Kew Bulletin* (1896, pp. 140–143). As in the case of vegetables (*K. B.*, 1894, pp. 219–223 ; 1895, pp. 307–315) it seems often cheaper to import than to grow. But considering how easily osiers may be cultivated on land unsuitable for any other crop, it seems strange that basket makers in the East of London should have to go to Madeira for their materials.

WICKERWORK.—This industry has lately been started in the East-end of London, and considerable quantities are made in the blind and deaf and dumb institutions throughout the United Kingdom ; in consequence of this a fairly large and increasing export trade is being done in the "osiers," of which the wickerwork is made.

The osier grown in Madeira is *Salix viminalis*. They are chiefly grown at the north side of the island, as they thrive to perfection on the wet portions of land in proximity to the "ribeiros," or mountain streams, which overflow their banks during the late autumn and winter months.

(F. O. 1897. Annual Series, No. 1871. *Report for the Year* 1896 *on the Trade of Madeira*, p. 4.)